FORM PTO-1390 (Modified) (REV 11-2000) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER	
30394-1057	
U.S APPLICATION NO. (IF KNOWN, SEE 37 CFR 1.5)	
09/936632	

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/NL00/00163	10 March 2000	11 March 1999

TITLE OF INVENTION

APPARATUS FOR THE INTERNAL INSPECTION OF PIPES AND TUBES AND THE LIKE

APPLICANT(S) FOR DO/EO/US

Leonardus Johannes GRUITROIJ, Christiaan Willem SCHOMPER, Jurgen Francois Philippe ELBERTSE

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S C. 371(f)). The submission must include itens (5), (6), (9) and (24) indicated below.
4. ☒ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
   a. ☐ is attached hereto (required only if not communicated by the International Bureau).
   b. ☒ has been communicated by the International Bureau
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ An English language translation of the International Application as filed (35 U S.C. 371(c)(2)).
   a. ☐ is attached hereto.
   b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
   a. ☐ are attached hereto (required only if not communicated by the International Bureau).
   b. ☒ have been communicated by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☐ have not been made and will not be made
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C 371 (c)(4)).
10. ☐ An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).
11. ☐ A copy of the International Preliminary Examination Report (PCT/IPEA/409)
12. ☐ A copy of the International Search Report (PCT/ISA/210).

Items 13 to 20 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1 97 and 1 98
14. ☐ An assignment document for recording A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☐ A **FIRST** preliminary amendment
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☐ A substitute specification
18. ☐ A change of power of attorney and/or address letter.
19. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
20. ☐ A second copy of the published international application under 35 U S.C. 154(d)(4).
21. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4)
22. ☒ Certificate of Mailing by Express Mail
23. ☒ Other items or information:

Unsigned Declaration and Power of Attorney for Patent Application

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 1 5)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
09/936632	PCT/NL00/00163	30394-1057

24. The following fees are submitted:.

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :

		CALCULATIONS PTO USE ONLY
☐	Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO	**$1000.00**
☒	International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO	**$860.00**
☐	International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO	**$710.00**
☐	International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4)	**$690.00**
☐	International preliminary examination fee (37 CFR 1 482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4)	**$100.00**
	ENTER APPROPRIATE BASIC FEE AMOUNT =	**$860.00**
	Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).	**$0.00**

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	
Total claims	5 - 20 =	0	x $18.00	**$0.00**
Independent claims	1 - 3 =	0	x $80.00	**$0.00**
Multiple Dependent Claims **(check if applicable)**.			☒	**$270.00**
	TOTAL OF ABOVE CALCULATIONS =			**$1,130.00**
☐	Applicant claims small entity status. (See 37 CFR 1.27) The fees indicated above are reduced by 1/2.			**$0.00**
	SUBTOTAL =			**$1,130.00**
	Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)). +			**$0.00**
	TOTAL NATIONAL FEE =			**$1,130.00**
☐	Fee for recording the enclosed assignment (37 CFR 1.21(h)) The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) **(check if applicable).**			**$0.00**
	TOTAL FEES ENCLOSED =			**$1,130.00**
			Amount to be: refunded	**$**
			charged	**$**

a. ☐ A check in the amount of _____ to cover the above fees is enclosed.

b. ☒ Please charge my Deposit Account No. **13-4213** in the amount of **$1,130.00** to cover the above fees. A duplicate copy of this sheet is enclosed.

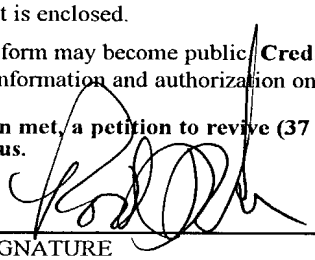
c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. **13-4213** A duplicate copy of this sheet is enclosed.

d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

CUSTOMER NO. 005179
Peacock, Myers & Adams, P.C.
Post Office Box 26927
Albuquerque, New Mexico 87125-6927
US
Telephone (505) 998-1500
FAX (505) 243-2542



SIGNATURE

Rod D. Baker
NAME

35,434
REGISTRATION NUMBER

11 September 2001
DATE

Apparatus for the internal inspection of pipes and tubes and the like

The invention relates to an apparatus for the internal inspection of pipes and tubes or the like, comprising an ultrasonic measuring head and a cable coupled to the measuring head, which cable can be coupled outside the pipe or tube to be measured to a device processing the measuring data. Such an apparatus is used for the internal inspection of pipes and tubes of in particular industrial furnaces in the petrochemical and chemical industry or in other (heavy) industries. The inspection serves for the detection of internal and surface corrosion such as pitting, but also for the detection of a reduction in wall thickness, mechanical deformations such as dents, and ovalities resulting from local overheating. In addition, the apparatus can be used to determine to what extent the pipes and tubes are fouled. To perform the measurement with the apparatus according to the preamble of claim 1, it is advantageous to use a measuring head as patented and specified in applicant's Dutch patent 1006007.

One of the problems that manifests itself when inspecting industrial furnaces of the above kind, is that they are constructed from a large number of horizontal or vertical pipes that are coupled by means of so-called return bends. These return bends have a radius of 1D, that is to say a bend diameter that is equal to the internal diameter of the pipe, and a gradient of 180°. As a result, every known apparatus for the internal inspection of such pipes and tubes will become lodged after two and at the most after three bends. A foremost problem is, however, that there is no known system of dimensions that allow the passage through bends having a radius of 1D.

It is the object of the invention to make this possible and to provide an apparatus that can be used irrespective of the number of bends to be taken in the fur-

nace to be inspected, and which in addition is designed such that it is possible to pass through bends having a radius of 1D.

In a first aspect the invention is therefore characterized in that at its distal end but behind the measuring head, the apparatus is provided with a reel for winding the cable on and off.

The fact that in the apparatus according to the invention the cable reel is located in the furnace and not as in the known system outside the furnace, makes it possible to pass through any number of bends without the apparatus becoming lodged in the pipes or tubes to be inspected.

Various kinds of cables may be used. For example, a cable may be used by which simultaneously a voltage is supplied to the measuring head in the furnace.

In a preferred embodiment of the apparatus according to the invention the same is characterized in that the cable is a glass-fibre cable and in that the apparatus near its distal end is provided with a feed device for feeding the measuring head. By using a glass-fibre cable, the cable can be very thin and may, for example, have a thickness of less than 0.125 mm, and longer cables may be wound onto the reel, for example, up to a length of 3 km, allowing very complex furnaces of extensive length to be inspected.

In a further aspect of the invention the apparatus is characterized in that the measuring head, the reel, the feed device, and any possible electronics present near the distal end are each incorporated individually in carrier members that can be moved through the pipe or tube. This supports the possibility that the apparatus is suited for passing through bends having a radius of 1D, which with the prior art apparatuses is in itself already a problem when applied with such tubes. Conveniently, the individual carrier members are then sequentially interconnected by means of flexible couplings.

One preferred embodiment of the apparatus according to the invention is characterized in that the flexible couplings are formed by hydraulic tubes with a steel covering. The fact that the tubes are provided with a steel covering means that the apparatus can be subjected to a tensile strain, which strain occurs in practice when the apparatus is moved in the furnace tubes by means of a differential pressure preceding and following the sequentially interconnected carrier members.

For the smooth passage through the bends in the pipes or tubes to be inspected, the length of the hydraulic tubes is advisably chosen in accordance with the flexural stiffness of the tubes.

The invention will now be elucidated with reference to the drawing, which in a single figure schematically and in cross section shows the portion of the tube to be inspected, with the apparatus for carrying out the inspection inserted therein.

To elucidate the invention, a tube portion 1 to be inspected is shown, comprising a so-called 1D bend, that is to say a bend whose radius is equal to the diameter of the tube 1. The bend shown has a gradient of 180°, that is to say the bend is a complete U-shape. Inserted into the tube 1 is an apparatus for the inspection of the tube, comprising an ultrasonic measuring head 2 and a glass-fibre cable 3 extending outside the respective tube of the furnace to be inspected, and which is coupled in the manner known to the person skilled in the art to a data processing unit, for example, a computer, for storing and optionally further processing the measuring data.

The glass-fibre cable 3 is unwound from a reel 4 which, in the forward-moving direction of the measuring head 2, is located behind said measuring head 2 near the distal end of the apparatus. To allow the apparatus to be moved forward through the tube 1, the cable 3 can be unwound from the reel 4, and to withdraw the apparatus from the tube 1, the glass-fibre cable 3 is rewound onto the reel 4.

The apparatus further comprises an electronic control unit 5 for the measuring head 2 and a battery supply 6 for feeding the measuring head 2. As is clearly shown in the Figure, the measuring head 2, the reel 4, the control electronics 5, and the feed device 6 are each individually incorporated in the carrier members that are movable through the pipe or tube 1.

The individual carrier members of the measuring head 2, the reel 4, the feed device 6, and the control electronics 5 are sequentially interconnected by means of flexible couplings 7. These flexible couplings 7 are formed by hydraulic tubes with a steel covering so that the couplings 7 can also tolerate a tensile strain, while primarily providing the possibility for the apparatus to pass through bends of the tubes 1 to be inspected. The lengths of the flexible couplings 7 should be selected in accordance with the degree of flexural stiffness of the hydraulic tubes from which the flexible couplings 7 are formed.

In a practical embodiment of the apparatus according to the invention, the flexible coupling 7 is formed as an approximately 10-cm long hydraulic tube, provided at both ends with an iron coupling connected with the housing of the carrier members. In the tube, three woven steel coverings may, for example, be provided for absorbing the tensile forces that are necessary for the transportation of the apparatus in the tube 1. Said steel coverings provide the flexible coupling 7 with some rigidity. By giving the flexible coupling a suitable length, the coupling may be designed such as to still allow passage through the bends in the tube.

When using a battery supply near the measuring head as explained above, the feed supply for the measuring head 2 does not need to come from outside the furnace to be inspected. The role of the applied glass-fibre cable 3 is then only that of data transporter.

To the person skilled in the art it will be obvious that the example discussed above serves merely to elu-

cidate the appended claims and that diverse variations are possible, all within the scope of said claims.

CLAIMS

1. An apparatus for the internal inspection of pipes and tubes (1) or the like, comprising an ultrasonic measuring head (2) and a cable (3) coupled to the measuring head, which cable can be coupled outside the pipe or tube (1) to be measured to a device processing the measuring data, **characterized** in that at its distal end but behind the measuring head (2), the apparatus is provided with a reel (4) for winding the cable (3) on and off.

2. An apparatus according to claim 1, **characterized** in that the cable is a glass-fibre cable (3) and in that the apparatus near its distal end is provided with a feed device (6) for feeding the measuring head (2).

3. An apparatus according to claim 1 or 2, **characterized** in that the measuring head (2), the reel (4), the feed device(6), and any possible electronics (5) present near distal end are each incorporated individually in carrier members that can be moved through the pipe or tube (1).

4. An apparatus according to claim 3, **characterized** in that the individual carrier members are sequentially interconnected by means of flexible couplings (7).

5. An apparatus according to claim 4, **characterized** in that the flexible couplings (7) are formed by hydraulic tubes with a steel covering.

6. An apparatus according to claim 5, **characterized** in that the length of the hydraulic tubes is chosen in accordance with the flexural stiffness of the tubes.

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : G01N 29/26

A1

(11) International Publication Number: WO 00/54043

(43) International Publication Date: 14 September 2000 (14.09.00)

(21) International Application Number: PCT/NL00/00163

(22) International Filing Date: 10 March 2000 (10.03.00)

(30) Priority Data:
1011525 11 March 1999 (11.03.99) NL

(71) Applicant *(for all designated States except US)*: A. HAK INDUSTRIAL SERVICES B.V. [NL/NL]; Utrechtsestraatweg 208, NL–3911 TX Rhenen (NL).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: GRUITROIJ, Leonardus, Johannes [NL/NL]; Jagerskamp 60, NL–6932 BW Westervoort (NL). SCHOMPER, Christiaan, Willem [NL/NL]; Van Heeckerenlaan 49, NL–6711 JM Ede (NL). ELBERTSE, Jurgen, Francois, Philipe [NL/NL]; Hoornbruglaan 52, NL–2281 AZ Rijswijk (NL).

(74) Agent: VAN BREDA, Jacques; Octrooibureau Los en Stigter B.V., Weteringschans 96, NL–1017 XS Amsterdam (NL).

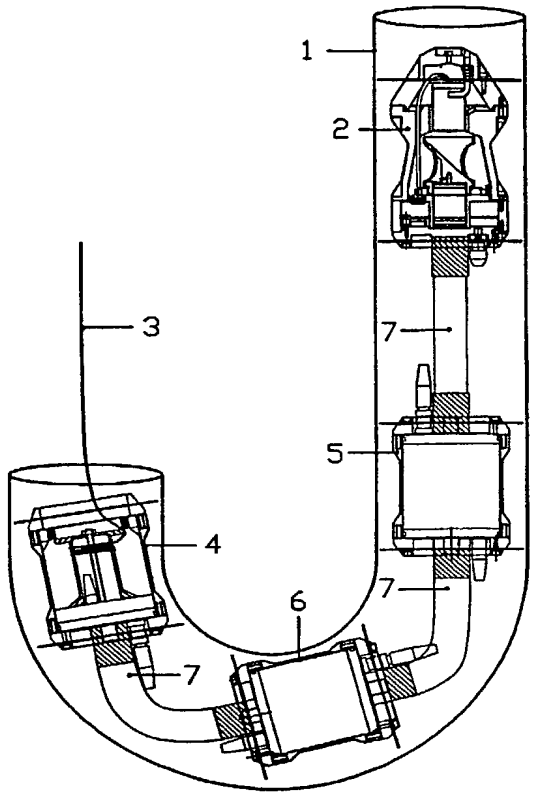
(81) Designated States: RU, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.
In English translation (filed in Dutch).

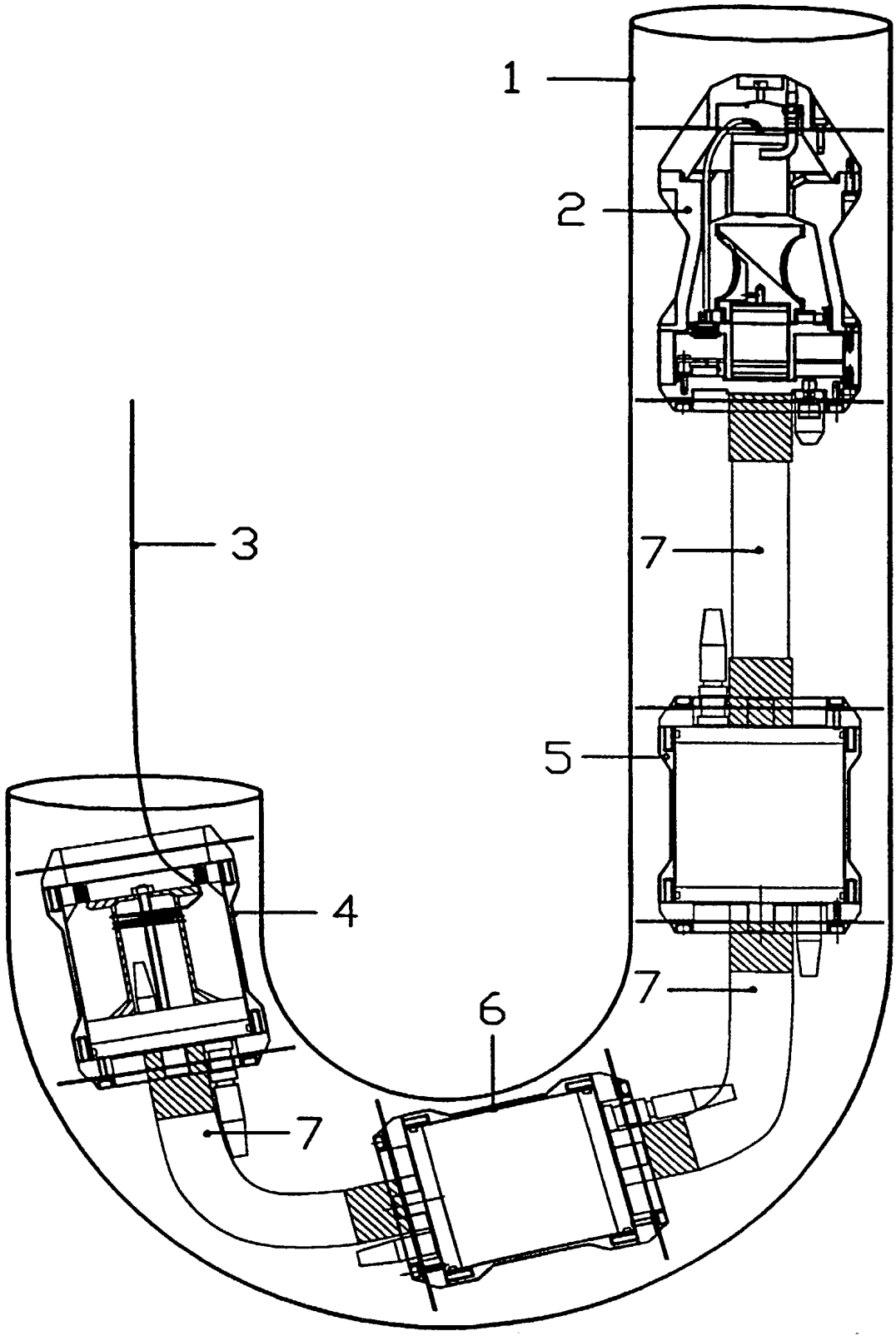
(54) Title: APPARATUS FOR THE INTERNAL INSPECTION OF PIPES AND TUBES AND THE LIKE

(57) Abstract

An apparatus for the internal inspection of pipes and tubes or the like, comprising an ultrasonic measuring head and a cable coupled to the measuring head, which cable can be coupled outside the pipe or tube to be measured to a device processing the measuring data, the apparatus being provided at its distal end but behind the measuring head, with a reel for winding the cable on and off.



1/1



Docket No.
30394-1057

21 FEB 2002

Declaration and Power of Attorney For Patent Application

English Language Declaration

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled
APPARATUS FOR THE INTERNAL INSPECTION OF PIPES AND TUBES AND THE LIKE

the specification of which

(check one)

☐ is attached hereto.

☒ was filed on **September 11, 2001** as United States Application No. or PCT International Application Number **09/936,632**

and was amended on _____
(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d) or Section 365(b) of any foreign application(s) for patent or inventor's certificate, or Section 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)			Priority Not Claimed
NL 1011525	**Netherlands**	**11 March 1999**	☐
(Number)	(Country)	(Day/Month/Year Filed)	
PCT/NL00/00163	**PCT**	**10 March 2000**	☐
(Number)	(Country)	(Day/Month/Year Filed)	
			☐
(Number)	(Country)	(Day/Month/Year Filed)	

I hereby claim the benefit under 35 U.S.C. Section 119(e) of any United States provisional application(s) listed below:

(Application Serial No.)	(Filing Date)
(Application Serial No.)	(Filing Date)
(Application Serial No.)	(Filing Date)

I hereby claim the benefit under 35 U. S. C. Section 120 of any United States application(s), or Section 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. Section 112, I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, C. F. R., Section 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application:

(Application Serial No.)	(Filing Date)	(Status) (patented, pending, abandoned)
(Application Serial No.)	(Filing Date)	(Status) (patented, pending, abandoned)
(Application Serial No.)	(Filing Date)	(Status) (patented, pending, abandoned)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. *(list name and registration number)*

JEFFREY D. MYERS, Reg. No. 35,964

Send Correspondence to:

Direct Telephone Calls to: *(name and telephone number)*

Jeffrey D. Myers (505) 998-1502

Full name of sole or first inventor **SIEMEN ROELOF VAN DER HEIDE**
Sole or first inventor's signature — Date 8-2-2002
Residence **Nijmegen, Netherlands**
Citizenship **Dutch**
Post Office Address **Eerste Oude Heselaan 90-92**
6541 PC Nijmegen, Netherlands

Full name of second inventor, if any **LEONARDUS JOHANNES GRUITROIJ**
Second inventor's signature — Date 8-2-2002
Residence **Westervoort, Netherlands**
Citizenship **Dutch**
Post Office Address **Jagerskamp 60**
6932 BW Westervoort, Netherlands

Mr. B. R. D. AITTON * NOTARIS TE TIEL *

~~For the legalisation of the~~ signatures of mr. Siemen Roelof ~~van der Heide, born on the 31th~~ of December 1965 at Madrid, and of ~~mr. Leonardus Johannes Gruitroij,~~ born on the 20th of April 1959 at ~~Arnhem, I, Bernard Robbert Dirk~~ Aitton, civil law notary, practising in Tiel, hereunto put my hand and seal this 8th day of February 2002.

Full name of third inventor, if any
JOOST MARTINUS HERMANUS PARENT

Third inventor's signature

Date
18-01-2002

Residence
Quebec, Canada

Citizenship
Dutch

Post Office Address
7201 Joseph Renand app. 201

H1K 3V7, Ville D'Anjou, Quebec, Canada

I, the undersigned, ROBERT GLAZER, Notary Public in and for the Province of Quebec, Canada, hereby attest that JOOST MARTINUS HERMANUS PARENT signed this document in my presence on January 18th, 2002.

ROBERT GLAZER, NOTARY PUBLIC

Full name of fourth inventor, if any
CHRISTIAAN WILLEM SCHOMPER

Fourth inventor's signature

Date
08-02-2002.

Residence
Ede, Netherlands

Citizenship
Dutch

Post Office Address
Van Heeckerenlaan 9

6711 JM Ede, Netherlands

Mr. B.R.D. AITTON NOTARIS TE TIEL

For the legalisation of the signature of mr. Christiaan Willem Schomper, born on the 10th of January 1960 at Rotterdam, I, Bernard Robbert Dirk Aitton, civil law notary, practising in Tiel, hereunto put my hand and seal this 8th day of February 2002.

Full name of fifth inventor, if any

Fifth inventor's signature

Date

Residence

Citizenship

Post Office Address

Full name of sixth inventor, if any

Sixth inventor's signature

Date

Residence

Citizenship

Post Office Address